

IV.4.1-MCP3 CALIBRATION SYSTEM MANUAL CALIBRATION PROGRAM (MCP3)

Purpose

The Manual Calibration Program (MCP3) is used to develop parameters needed by NWSRFS models and techniques through the simulation of periods of historical records.

Manual adjustments to parameters are made until simulated response agrees satisfactorily with observed values. Comparisons of simulated and observed response can be obtained from a number of display and statistical techniques that are provided.

Program MCP3 is based on the Operations Table (see Chapter V.3) and is compatible with the following other parts of NWSRFS:

- o The Forecast Component of the Operational Forecast System (OFS)
- o The Automatic Parameter Optimization Program (OPT3)
- o The Extended Streamflow Prediction (ESP) function

The calibration programs, including MCP3, execute a single Segment for a relatively long period of record, usually in terms of years. The operational programs execute many Segments for periods in terms of days or, at most, months as in the case of ESP. MCP3 simulates a long period of record by executing the Operations Table one month at a time.

Input Summary

The input data for MCP3 primarily consists of defining the Operations that are to be used and the time series needed to store the data needed by the Operations.

The input summary is divided into two parts:

- o Required input.
- o Optional input needed for special cases, such as executing partial months or generating debug output.

Card Format Column Contents

Required input cards

Card Group A contains general run information

A1	A80	1-80	General information.
A2			Period of record for the run:
	I5	1-5	First month

<u>Card</u>	<u>Format</u>	<u>Column</u>	<u>Contents</u>
	I5	5-10	First year (4 digits)
	I5	11-15	Last month
	I5	16-20	Last year (4 digits)
	2X,A3	23-25	Output units option. Default is all output in Metric units. Enter 'ENG' to get English units for all hydrograph displays and for output from most other Operations. A few Operations only output in Metric units.

Card Group D contains information about each time series that is used. All time series used by the Operations in card group E must be defined in this section. A more complete description of defining and identifying time series is contained in Chapter V.2.

D1	A8	1-8	'DEF-TS'
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Repeat card D2 through D4 for each time series that is used in the Operations Table.

D2	A8	1-8	Time series identifier. All blanks or imbedded dashes are not allowed. Also, the first 4 characters cannot be 'END '.
	3X,A4	12-15	Time series data type code (see Section V.2.2).
	3X,I2	19-20	Time series data time interval. Allowable time intervals are 1, 2, 3, 4, 6, 8, 12 and 24 hours.

The combination of the identifier, data type code and time interval must be unique for each time series used in a Segment.

12X,A8	33-40	Type of time series:
		'INTERNAL' = time series is only used internally within the Segment to transfer data from one Operation to another and is not read from a file or written to a file (default)
		'INPUT' = time series is to be read from a data file
		'OUTPUT' = time series is to be written to a data file during or after the execution of the Operations Table

Card	Format	Column	Contents
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Card D3 is only needed for INPUT time series.

D3			Time series location information (see Section V.2.4). The data file must contain time series data for the entire run period specified on card A2.
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Card D4 is only needed for OUTPUT time series.

D4	A32	1-32	File name
	A12	40-51	Station identifier (optional)
	A20	52-71	General descriptive information about the time series (optional)
	A9	72-80	Format to be used for data values in the DATACARD output (optional - default is 6F10.2 - if specified must include parenthesis)
D5	A4	1-4	'END '

Card Group E contains information about each Operation that is used. Operations must be input in the order they are to be executed. A general input summary for defining the Operations Table for all programs is given in Section V.3.1.

Repeat cards E1 and E2 for each Operation.

E1	A8	1-8	Identifier for the type of Operation (see Section V.3.2).
	4X,A8	13-20	User supplied name for the Operation. All blanks and 'INPUT CO' are not allowed. Name is not required for the 'CLEAR-TS' Operation.

The combination of the identifier and name must be unique for each Operation within a Segment ('CLEAR-TS' Operations are an exception).

E2	-	-	The input cards for the Operation (see Section V.3.3).
E3	A4	1-4	'STOP'

Optional input cards

Use the following input to start and end in the middle of a month:

<u>Card</u>	<u>Format</u>	<u>Column</u>	<u>Contents</u>
A2	-	1-25	Same as given specified.
	5X,I5	31-35	Initial day of the run within the first month.
	5X,I5	41-45	Last day of the run within the last month.

Special features can be invoked by including card group B immediately after group A.

To generate debug output include cards B1 and B2.

B1	A8	1-8	'SETBUG'
B2	-	-	SETBUG input (see Section IX.3.3B-FSETBG)

Program Execution Information

See Chapter I.2 for information about how to execute the program.

Error Messages

General error messages generated by the program MCP3 are as follows. Other error messages are generated when defining time series (see Section V.2.3) or Operations (see Sections V.3.1 and V.3.3).

- **FATAL ERROR** PROGRAM IS TERMINATED BECAUSE ONE OR MORE ERRORS OCCURRED WHILE READING THE INPUT CARDS.**

Action: Correct all errors. The program will not execute until all errors are corrected.
- **ERROR** DUE TO PRECEDING ERRORS IN READING DATA, EXECUTION WILL STOP, BUT READING OF TIME SERIES WILL CONTINUE.**

****ERROR** DUE TO PRECEDING ERRORS IN AN OPERATION, EXECUTION WILL STOP, BUT READING OF TIME SERIES WILL CONTINUE.**

****ERROR** DUE TO PRECEDING ERRORS WRITING DATA WILL STOP, BUT READING AND EXECUTION WILL CONTINUE.**

Action: Correct indicated errors.
- **FATAL ERROR** THE ENDING DATE FOR THE RUN XX/XX/XXXX IS PRIOR TO THE STARTING DATE XX/XX/XXXX.**

Action: Correct run dates on card A2.
- **FATAL ERROR** INPUT CARDS ARE NOT IN THE PROPER ORDER. A 'STOP' CARD WAS ENCOUNTERED BEFORE FINDING A 'DEF-TS ' CARD.**

Action: Check input cards.

5. **ERROR** INPUT TIME SERIES XXXXXXXX XXXX XX HOURS CONTAINS MISSING DATA FOR XX/XXXX. MISSING DATA ARE NOT ALLOWED FOR THIS DATA TYPE.

Action: Edit the missing data values or change the data type code.

6. **ERROR** NOT ENOUGH SPACE ON THE WATER YEAR SCRATCH FILE.

Action: Reduce the number of Operations that perform water year computations or displays or call to have the size of the scratch file increased.

Output Data

Program MCP3 generates the following types of output:

1. Printer output consisting of several pages listing the run information including time series and Operations used, plus execution output from the Operations. Output generated by each Operation is described in Section V.3.3.
2. Time series output to the data file if specified in card group D of the input summary.

Sample Input and Output

Sample input is shown in Figure 1 and sample output is shown in Figure 2.

Figure 1. Sample input for program MCP3

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- Column -

5    10   15   20   25   30   35   40   45   50   55   60   65   70   75   80
-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
FRENCH BROAD RIVER BASIN ABOVE BLANTYRE, NORTH CAROLINA
  10 1953   01 1954
DEF-TS
BLANTYRE  MAP      6          INPUT
fromnas/Blantyre_MAP
BLANTYRE  RAIM      6
BLANTYRE  SASC     24
BLANTYRE  INFW      6
BLANTYRE  ROCL     24
BLANTYRE  SMZC     24
BLANTYRE  MAT       6          INPUT
fromnas/FrenchBroad_MAT
GREENVIL  PTPE     24          INPUT
fromnas/E.Greenville_PTPE
ROSMAN    QINE      3          INPUT
fromnas/FrenchBroad_QINE
BREVARD   QINE      3          INPUT
fromnas/Davidson_QINE
BLANTYRE  SQIN      3
BLANTYRE  QME      24          INPUT
fromnas/Blantyre_QME
BLANTYRE  SQME     24
BLANTYRE  QIN       6          INPUT
fromnas/FrenchBroad_QIN
END
SNOW-17    BLANTYRE
FRENCH BROAD-BLANTYRE 915. 35.0          YES SUMS
  6 BLANTYRE MAP      1.000          BLANTYRE RAIM
  BLANTYRE MAT       6
          BLANTYRE SASC     24
1.30 0.90 0.400.100 125.
0.15 0.50 0.0 1.0 0.10 0.20
0.12 0.17 0.20 0.22 0.25 0.30 0.38 0.50 0.70
SAC-SMA    BLANTYRE
FRENCH BROAD-BLANTYRE      6 BLANTYRE RAIM          BLANTYRE INFW
  BLANTYRE SASC     24 BLANTYRE BLANTYRE SUMS
          1.0001.000 85.0 25.00.3000.0350.1000.100 00.250
          6.0 1.50 180.290.01000.0.100.00500.2000.300 0.0
GREENVIL PTPE 0.700.500.360.220.321.201.101.101.100.900.750.75
          70.0 0.0 130. 0.0 250. 200.
10/53
UNIT-HG    BLANTYRE
FRENCH BROAD-BLANTYRE      185.0 22
  BLANTYRE INFW      6 ROSMAN  QINE      3
    0.2600  3.0000  5.2900  3.1700  1.0500  0.7900  0.6300
    0.4700  0.4000  0.3400  0.3000  0.2700  0.2400  0.2100
    0.1800  0.1500  0.1200  0.0900  0.0700  0.0500  0.0300
    0.0200
LAG/K      ROSMAN
ROSMAN    QINE      3 BLANTYRE SQIN      5      0
    10.000  0.0 12.000 100.000 18.000 250.000          X
    18.000 300.000  9.000 450.000
    0.0
    0
UNIT-HG    BREVARD
FRENCH BROAD-BLANTYRE      125.1 21
  BLANTYRE INFW      6 BREVARD  QINE      3
    0.1800  2.8200  4.0100  1.4800  0.5100  0.3900  0.3500
    0.2900  0.2600  0.2300  0.2000  0.1900  0.1700  0.1300
    0.1100  0.0800  0.0600  0.0500  0.0400  0.0200  0.0100

```

Figure 1. Sample input for program MCP3

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- Column -

5    10    15    20    25    30    35    40    45    50    55    60    65    70    75    80
-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
LAG/K      BREVARD
BREVARD  QINE  3 BLANTYRE SQIN  3      4      0
5.000      0.0      6.000      70.000      9.000      200.000      X
6.000      350.000
0.0
0
UNIT-HG     LOCAL
FRENCH BROAD-BLANTYRE      176.0      22
BLANTYRE INFW  6 BLANTYRE SQIN  3
0.2500      2.8500      5.0300      3.0200      1.0000      0.7500      0.6000
0.4500      0.3800      0.3200      0.2900      0.2600      0.2300      0.2000
0.1700      0.1400      0.1100      0.0800      0.0700      0.0500      0.0300
0.0200
LAG/K      BLANTYRE
BLANTYRE SQIN  3      0      0      12
0.0
9.000      0.0      3.000      50.000      9.000      90.000      X
36.000      110.000      42.000      130.000      42.000      170.000      X
36.000      180.000      21.000      200.000      12.000      260.000      X
6.000      340.000      4.000      400.000      3.000      500.000
0
MEAN-Q     BLANTYRE
BLANTYRE SQIN  3 BLANTYRE SQME  24
INSQPLOT    BLANTYRE
FRENCH BROAD-BLANTYRE      2      3      1
BLANTYRE RAIM  6      RAIM+MELT
BLANTYRE INFW  6      RUNOFF
BLANTYRE QIN   6      OBSERVED      +
BLANTYRE SQIN  3      SIMULATED      *
WY-PLOT     BLANTYRE
FRENCH BROAD-BLANTYRE      2      767.0 200. YES
BLANTYRE QME      OBSERVED      +
BLANTYRE SQME      SIMULATED      *
BLANTYRE RAIM  6      BLANTYRE      BLANTYRE
STOP

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Figure 2. Sample output for program MCP3

NWSRFS CALIBRATION SYSTEM *** PROGRAMMER: R. J. ...

[illegible]

Figure 2. Sample output for program MCP3

[illegible]

Figure 2. Sample output for program MCP3

*****UNIT#**OPERATIONUNIT*NAMEOGLANTACDPALETHSTATEGOUNTIDYTONMOR-PIRKHATDMANIN/HASADAMW/WHZKZKRS-CENTVETHTAHOEDW+COPTENHABE

Figure 2. Sample output for program MCP3

[illegible]

Figure 2. Sample output for program MCP3

[illegible]

Figure 2. Sample output for program MCP3

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Figure 2. Sample output for program MCP3

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Figure 2. Sample output for program MCP3

[illegible]

Figure 2. Sample output for program MCP3

'BLANTYREHAY104510WS00WD00ET00NH00RS00HS00IS00CS00CH00PT00PP00MT00MR00MC00SC00SD00AR00BR00QR00AG00SA00CO00B00S00NO00VE00R00

Figure 2. Sample output for program MCP3

[illegible]

Figure 2. Sample output for program MCP3

[illegible]

Figure 2. Sample output for program MCP3

1617181920212223242526272829303132333435363738394041424344454647484950515253545556575859606162636465666768697071727374757677787980818283848586878889909192939495969798991001011021031041051061071081091101111121131141151161171181191201211221231241251261271281291301311321331341351361371381391401411421431441451461471481491501511521531541551561571581591601611621631641651661671681691701711721731741751761771781791801811821831841851861871881891901911921931941951961971981992002012022032042052062072082092102112122132142152162172182192202212222232242252262272282292302312322332342352362372382392402412422432442452462472482492502512522532542552562572582592602612622632642652662672682692702712722732742752762772782792802812822832842852862872882892902912922932942952962972982993003013023033043053063073083093103113123133143153163173183193203213223233243253263273283293303313323333343353363373383393403413423433443453463473483493503513523533543553563573583593603613623633643653663673683693703713723733743753763773783793803813823833843853863873883893903913923933943953963973983994004014024034044054064074084094104114124134144154164174184194204214224234244254264274284294304314324334344354364374384394404414424434444454464474484494504514524534544554564574584594604614624634644654664674684694704714724734744754764774784794804814824834844854864874884894904914924934944954964974984995005015025035045055065075085095105115125135145155165175185195205215225235245255265275285295305315325335345355365375385395405415425435445455465475485495505515525535545555565575585595605615625635645655665675685695705715725735745755765775785795805815825835845855865875885895905915925935945955965975985996006016026036046056066076086096106116126136146156166176186196206216226236246256266276286296306316326336346356366376386396406416426436446456466476486496506516526536546556566576586596606616626636646656666676686696706716726736746756766776786796806816826836846856866876886896906916926936946956966976986997007017027037047057067077087097107117127137147157167177187197207217227237247257267277287297307317327337347357367377387397407417427437447457467477487497507517527537547557567577587597607617627637647657667677687697707717727737747757767777787797807817827837847857867877887897907917927937947957967977987998008018028038048058068078088098108118128138148158168178188198208218228238248258268278288298308318328338348358368378388398408418428438448458468478488498508518528538548558568578588598608618628638648658668678688698708718728738748758768778788798808818828838848858868878888898908918928938948958968978988999009019029039049059069079089099109119129139149159169179189199209219229239249259269279289299309319329339349359369379389399409419429439449459469479489499509519529539549559569579589599609619629639649659669679689699709719729739749759769779789799809819829839849859869879889899909919929939949959969979989991000100110021003100410051006100710081009101010111012101310141015101610171018101910201021102210231024102510261027102810291030103110321033103410351036103710381039104010411042104310441045104610471048104910501051105210531054105510561057105810591060106110621063106410651066106710681069107010711072107310741075107610771078107910801081108210831084108510861087108810891090109110921093109410951096109710981099110011011102110311041105110611071108110911101111111211131114111511161117111811191120112111221123112411251126112711281129113011311132113311341135113611371138113911401141114211431144114511461147114811491150115111521153115411551156115711581159116011611162116311641165116611671168116911701171117211731174117511761177117811791180118111821183118411851186118711881189119011911192119311941195119611971198119912001201120212031204120512061207120812091210121112121213121412151216121712181219122012211222122312241225122612271228122912301231123212331234123512361237123812391240124112421243124412451246124712481249125012511252125312541255125612571258125912601261126212631264126512661267126812691270127112721273127412751276127712781279128012811282128312841285128612871288128912901291129212931294129512961297129812991300130113021303130413051306130713081309131013111312131313141315131613171318131913201321132213231324132513261327132813291330133113321333133413351336133713381339134013411342134313441345134613471348134913501351135213531354135513561357135813591360136113621363136413651366136713681369137013711372137313741375137613771378137913801381138213831384138513861387138813891390139113921393139413951396139713981399140014011402140314041405140614071408140914101411141214131414141514161417141814191420142114221423142414251426142714281429143014311432143314341435143614371438143914401441144214431444144514461447144814491450145114521453145414551456145714581459146014611462146314641465146614671468146914701471147214731474147514761477147814791480148114821483148414851486148714881489149014911492149314941495149614971498149915001501150215031504150515061507150815091510151115121513151415151516151715181519152015211522152315241525152615271528152915301531153215331534153515361537153815391540154115421543154415451546154715481549155015511552155315541555155615571558155915601561156215631564156515661567156815691570157115721573157415751576157715781579158015811582158315841585158615871588158915901591159215931594159515961597159815991600160116021603160416051606160716081609161016111612161316141615161616171618161916201621162216231624162516261627162816291630163116321633163416351636163716381639164016411642164316441645164616471648164916501651165216531654165516561657165816591660166116621663166416651666166716681669167016711672167316741675167616771678167916801681168216831684168516861687168816891690169116921693169416951696169716981699170017011702170317041705170617071708170917101711171217131714171517161717171817191720172117221723172417251726172717281729173017311732173317341735173617371738173917401741174217431744174517461747174817491750175117521753175417551756175717581759176017611762176317641765176617671768176917701771177217731774177517761777177817791780178117821783178417851786178717881789179017911792179317941795179617971798179918001801180218031804180518061807180818091810181118121813181418151816181718181819182018211822182318241825182618271828182918301831183218331834183518361837183818391840184118421843184418451846184718481849185018511852185318541855185618571858185918601861186218631864186518661867186818691870187118721873187418751876187718781879188018811882188318841885188618871888188918901891189218931894189518961897189818991900190119021903190419051906190719081909191019111912191319141915191619171918191919201921192219231924192519261927192819291930193119321933193419351936193719381939194019411942194319441945194619471948194919501951195219531954195519561957195819591960196119621963196419651966196719681969197019711972197319741975197619771978197919801981198219831984198519861987198819891990199119921993199419951996199719981999200020012002200320042005200620072008200920102011201220132014201520162017201820192020202120222023202420252026202720282029203020312032203320342035203620372038203920402041204220432044204520462047204820492050205120522053205420552056205720582059206020612062206320642065206620672068206920702071207220732074207520762077207820792080208120822083208420852086208720882089209020912092209320942095209620972098209921002101210221032104210521062107210821092110211121122113211421152116211721182119212021212122212321242125212621272128212921302131213221332134213521362137213821392140214121422143214421452146214721482149215021512152215321542155215621572158215921602161216221632164216521662167216821692170217121722173217421752176217721782179218021812182218321842185218621872188218921902191219221932194219521962197219821992200220122022203220422052206220722082209221022112212221322142215221622172218221922202221222222232224222522262227222822292230223122322233223422352236223722382239224022412242224322442245224622472248224922502251225222532254225522562257225822592260226122622263226422652266226722682269227022712272227322742275227622772278227922802281228222832284228522862287228822892290229122922293229422952296229722982299230023012302230323042305230623072308230923102311231223132314231523162317231823192320232123222323232423252326232723282329233023312332233323342335233623372338233923402341234223432344234523462347234823492350235123522353235423552356235723582359236023612362236323642365236623672368236923702371237223732374237523762377237823792380238123822383238423852386238723882389239023912392239323942395239623972398239924002401240224032404240524062407240824092410241124122413241424152416241724182419242024212422242324242425242624272428242924302431243224332434243524362437243824392440244124422443244424452446244724482449245024512452245324542455245624572458245924602461246224632464246524662467246824692470247124722473247424752476247724782479248024812482248324842485248624872488248924902491249224932494249524962497249824992500250125022503250425052506250725082509251025112512251325142515251625172518251925202521252225232524252525262527252825292530253125322533253425352536253725382539254025412542254325442545254625472548254925502551255225532554255525562557255825592560256125622563256425652566256725682569257025712572257325742575257625772578257925802581258225832584258525862587258825892590259125922593259425952596259725982599260026012602260326042605260626072608260926102611261226132614261526162617261826192620262126222623262426252626262726282629263026312632263326342635263626372638263926402641264226432644264526462647264826492650265126522653265426552656265726582659266026612662266326642665266626672668266926702671267226732674267526762677267826792680268126822683268426852686268726882689269026912692269326942695269626972698269927002701270227032704270527062707270827092710271127122713271427152716271727182719272027212722272327242725272627272728272927302731273227332734273527362737273827392740274127422743274427452746274727482749275027512752275327542755275627572758275927602761276227632764276527662767276827692770277127722773277427752776277727782779278027812782278327842785278627872788278927902791279227932794279527962797279827992800280128022803280428052806280728082809281028112812281328142815281628172818281928202821282228232824282528262827282828292830283128322833283428352836283728382839284028412842284328442845284628472848284928502851285228532854285528562857285828592860286128622863286428652866286728682869287028712872287328742875287628772878287928802881288228832884288528862887288828892890289128922893289428952896289728982899290029012902290329042905290629072908290929102911291229132914291529162917291829192920292129222923292429252926292729282929293029312932293329342935293629372938293929402941294229432944294529462947294829492950295129522953295429552956295729582959296029612962296329642965296629672968296929702971297229732974297529762977297829792980298129822983298429852986298729882989299029912992299329942995299629972998299930003001300230033004300530063007300830093010301130123013301430153016301730183019302030213022302330243025302630273028302930303031303230333034303530363037303830393040304130423043304430453046304730483049305030513052305330543055305630573058305930603061306230633064306530663067306830693070307130723073307430753076307730783079308030813082308330843085308630873088308930903091309230933094309530963097309830993100310131023103310431053106310731083109311031113112311331143115311631173118311931203121312231233124312531263127312831293130313131323133313431353136313731383139314031413142314331443145314631473148314931503151315231533154315531563157315831593160316131623163316431653166316731683169317031713172317331743175317631773178317931803181318231833184318531863187318831893190319131923193319431953196319731983199320032013202320332043205320632073208320932103211321232133214321532163217321832193220322132223223322343225322632273228322932303231323232333234323532363237323832393240324132423243324432453246324732483249325032513252325332543255325632573258325932603261326232633264326532663267326832693270327132723273327432753276327732783279328032813282328332843285328632873288328932903291329232933294329532963297329832993300330133023303330433053306330733083309331033113312331333143315331633173318331933203321332233233324332533263327332833293330333133323333333433353336333733383339334033413342334333443345334633473348334933503351335233533354335533563357335833593360

Figure 2. Sample output for program MCP3

[illegible]